



ENVIRONMENTAL COMPLIANCE SERVICES, INC.

December 31, 1998
Project #40099.10
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JAN 11 10 29 AM '99

Mr. Chuck Schwer, Supervisor
Sites Management Section
VT DEC Waste Management Division
103 South Main Street
Waterbury, VT 05671-0404

**RE: Site Investigation Report
Brattleboro Wastewater Treatment Plant, Brattleboro, VT
DEC Site #98-2405**

Dear Mr. Schwer:

Enclosed please find the above-referenced report for your review. If you have any questions or require further information, please call me at 802-257-1195.

Sincerely,
ENVIRONMENTAL COMPLIANCE SERVICES, INC.

David C. Balk, P.G.
Project Manager

enclosure

cc: Steve Barrett, Brattleboro DPW

Phase	Type
X Initial Site Investigation <input type="checkbox"/> Corrective Action Feasibility Investigation <input type="checkbox"/> Corrective Action Plan <input type="checkbox"/> Corrective Action Summary Report <input type="checkbox"/> Operations and Monitoring Report	<input type="checkbox"/> Work Scope X Technical Report <input type="checkbox"/> PCF Reimbursement Request <input type="checkbox"/> General Correspondence

JAN 11 10 29 AM '99

Site Investigation Report
 Brattleboro Wastewater Treatment Plant
 606 Vernon Road
 Brattleboro, Vermont
 SMS Site #98-2405

Prepared for:

Brattleboro Department of Public Works
 Brattleboro, Vermont 05301
 Contact: Steve Barrett
 Phone: (802) 254-4255

Prepared by:

Environmental Compliance Services, Inc.
 157 Old Guilford Road #6
 Brattleboro, VT 05301
 Contact: David C. Balk, P.G.
 Phone: (802) 257-1195

Project No.: 40099.10

December 31, 1998

**Site Investigation Report
Brattleboro Wastewater Treatment Plant, Brattleboro
Site #98-2405**

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1.0 Introduction

On June 22, 1998 a 1,500 gallon #2 fuel oil underground storage tank (UST) was removed from outside the Brattleboro Wastewater Treatment Plant ("the site;" see locus map, Appendix A). Soils from the tank excavation were screened with a Photovac Model 2020 photoionization detector (PID) for the presence of Volatile Organic Compound (VOC) concentrations. The levels of contamination ranged from 0 to 178 parts per million (ppm). A tank closure report was submitted to the VT DEC, and resulted in the request for subsurface investigations to assess the extent and degree of petroleum contamination in soil and/or groundwater at the site.

Environmental Compliance Services, Inc. of Brattleboro, VT submitted a work plan for these additional investigations to the VT DEC on behalf of Steve Barrett of the Brattleboro Department of Public Works. The work plan included soil boring advancement, groundwater monitoring well installation, groundwater sampling and analysis, and a sensitive receptor survey. It was approved by the Sites Management Section (SMS) on September 28, 1998.

This report documents the work performed by ECS at the site and presents results, conclusions and recommendations.

2.0 Site Description

The subject property exists at an elevation of approximately 200 feet above mean sea level. The Brattleboro Wastewater Treatment Plant consists of three buildings and a series of water treatment tanks. The site is surrounded by industrially developed land. To the west is railroad tracks and to the east is the Connecticut River; the tracks and river converge north of the site. To the south is Georgia Pacific, a paper manufacturing company. Drinking water is supplied to the town from a well located topographically upgradient of the site, approximately one mile away.

Observations made during the removal of the fuel oil UST in June 1998 indicate that the soils in the tank pit were dark brown, coarse sand and gravel to 8 feet below ground surface (bgs). Groundwater was encountered at approximately seven feet bgs. No ledge was encountered in the tank grave. A new #2 fuel oil double walled UST was installed approximately 100 feet away from the former tank location.

3.0 Work Performed

3.1 Soil Borings and Monitoring Wells

Using a hollow stem auger drill rig on October 16, 1998, ECS installed four monitoring wells, designated ECS-1, ECS-2, ECS-3, and ECS-4. Monitoring well locations are shown on the site plan in Appendix B. The wells are 15 feet deep, and constructed of 2 inch diameter schedule 40 PVC slotted screen (size 10) with flush mounted road boxes. Monitoring well construction logs are presented in Appendix C.

3.2 Field Screening of Soil Samples

During drilling, split-spoon soil samples were obtained at five-foot intervals from each of the boreholes. The samples were field screened for VOCs with a PID (field calibrated to an isobutylene span gas and referenced to benzene), using bag headspace protocol. VOC levels ranging from 1.3 to 8.5 ppm were detected in the borings.

3.3 Groundwater Gauging and Sampling

On October 26, 1998, depth to groundwater was measured from the top of the PVC well casings at monitoring wells ECS-1, ECS-2, ECS-3, and ECS-4 by ECS personnel using a Slope electronic water level indicator accurate to 0.01 foot.

Groundwater from all the monitoring wells was sampled on October 26, 1998, by ECS personnel using disposable plastic bailers. Samples were obtained after three borehole volumes of groundwater were evacuated from each well. A duplicate groundwater sample from ECS-4 was obtained for quality control purposes. All samples were stored on ice immediately upon collection, and refrigerated until delivery was made to Spectrum Analytical, Inc. in Agawam, Massachusetts for analysis of BTEX compounds, MTBE, Trimethylbenzenes and Naphthalene by EPA Method 8021B and Total Petroleum Hydrocarbons (TPH) by EPA Method 8100M.

4.0 Results

4.1 Groundwater Potentiometric Data

Data from the October 26, 1998 gauging of groundwater levels are presented in Table 1. Depth to groundwater ranged from 5.76 feet in ECS-2 to 6.00 feet in ECS-3.

Table 1. Groundwater potentiometric data.

Date	ECS-1	ECS-2	ECS-3	ECS-4
PVC elevation	99.46	99.32	99.59	99.45
10/26/98	93.60	93.56	93.59	93.55
Elevations measured in feet from an arbitrary datum.				

Groundwater contours were added to the site plan presented in Appendix B. The map shows that the groundwater table is relatively flat at the site, trending slightly to the northeast.

4.2 Laboratory Analysis of Groundwater Samples

The groundwater samples obtained on October 26, 1998 were analyzed by EPA Methods 8021B and 8100M. Results are presented in Table 2, which includes Primary Groundwater Quality Standards (PGQS) for reference. The complete laboratory data sheets and chain of custody record are presented in Appendix D.

Table 2. Results of laboratory analysis of groundwater samples.

Date	Compound	PGQS	ECS-1	ECS-2	ECS-3	ECS-4	
10/26/98	Benzene	5.0	ND	ND	ND	1.1	1.1
	Toluene	1000	ND	ND	ND	0.74	0.78
	Ethylbenzene	7000	ND	ND	ND	1.7	1.5
	Xylenes	10,000	ND	ND	ND	17.7	16.1
	Total BTEX		ND	ND	ND		
	Naphthalene	20	ND	ND	ND	11	9.9
	1,2,4-Trimethylbenzene	5.0	ND	ND	ND	21	17
	1,3,5-Trimethylbenzene	4.0	ND	ND	ND	13	10
	MTBE	40	ND	ND	3.9	18	20
	TPH		1.1	0.8	0.9	4.8	NT
<i>Results reported in ug/L (ppb). ND = Not detected. Split cells indicate duplicate analyses. Boldface type indicates PGQS exceedances. NT = Not tested for.</i>							

5.0 Risk Evaluation

5.1 Potential Sources

Only low levels of TPH and MTBE were detected in groundwater samples from the monitoring wells outside of the tank grave; however, PGQS for 1,2,4-Trimethylbenzene and 1,3,5-Trimethylbenzene were exceeded in groundwater from ECS-4, located in the tank grave. It is reasonably clear that the source of this contamination is related to the fuel oil UST which has been removed from the site. Approximately 27 cubic yards of soil were excavated and polyencapsulated to the north of the sewage drying beds, removing an additional source of contamination which could pose a risk impact to sensitive receptors.

5.2 Potential Receptors

The potential sensitive receptors of most immediate concern are site workers at the site, as no residential properties are located within a 1/4 mile radius of the site. The Brattleboro Wastewater Treatment Plant is located approximately 6 feet topographically and hydrogeologically downgradient from the tank grave. The municipal water supply well is located upgradient and over 1/2 mile from the tank grave. There are no water supplies known to be located within a 1/2 mile radius of the site. The only downgradient structure is the Wastewater Treatment Plant building, located between the tank grave and the Connecticut River. Air in the building was screened for VOCs with a PID. No VOCs were detected in the building.

The Connecticut River, located approximately 200 feet downgradient and to the east, is the nearest potential sensitive environmental receptor.

6.0 Conclusions and Recommendations

6.1 Conclusions

ECS presents the following conclusions based on the information obtained at the site to date:

- Groundwater flow direction at the site can be interpreted to be to the south-southeast, in the same direction as the Connecticut River flow.
- Low levels of contaminants tested for were detected in groundwater from monitoring wells installed west and east of the former location of the fuel oil UST removed from the site in June 1998. PGQS for Trimethylbenzenes are exceeded in groundwater from a monitoring well in the tank grave.
- No bedrock is located in the tank grave, groundwater is within 6 feet bgs, and no confining layer was present.
- No VOCs were detected in the indoor air of the site building, the nearest downgradient structure from the tank grave.
- The probable source of the release, a 1,500 gallon fuel oil UST, has been removed from the site. Presently, contamination of soil and groundwater appears to have been restricted to the tank grave and excavated and stockpiled soils.

6.2 Recommendations

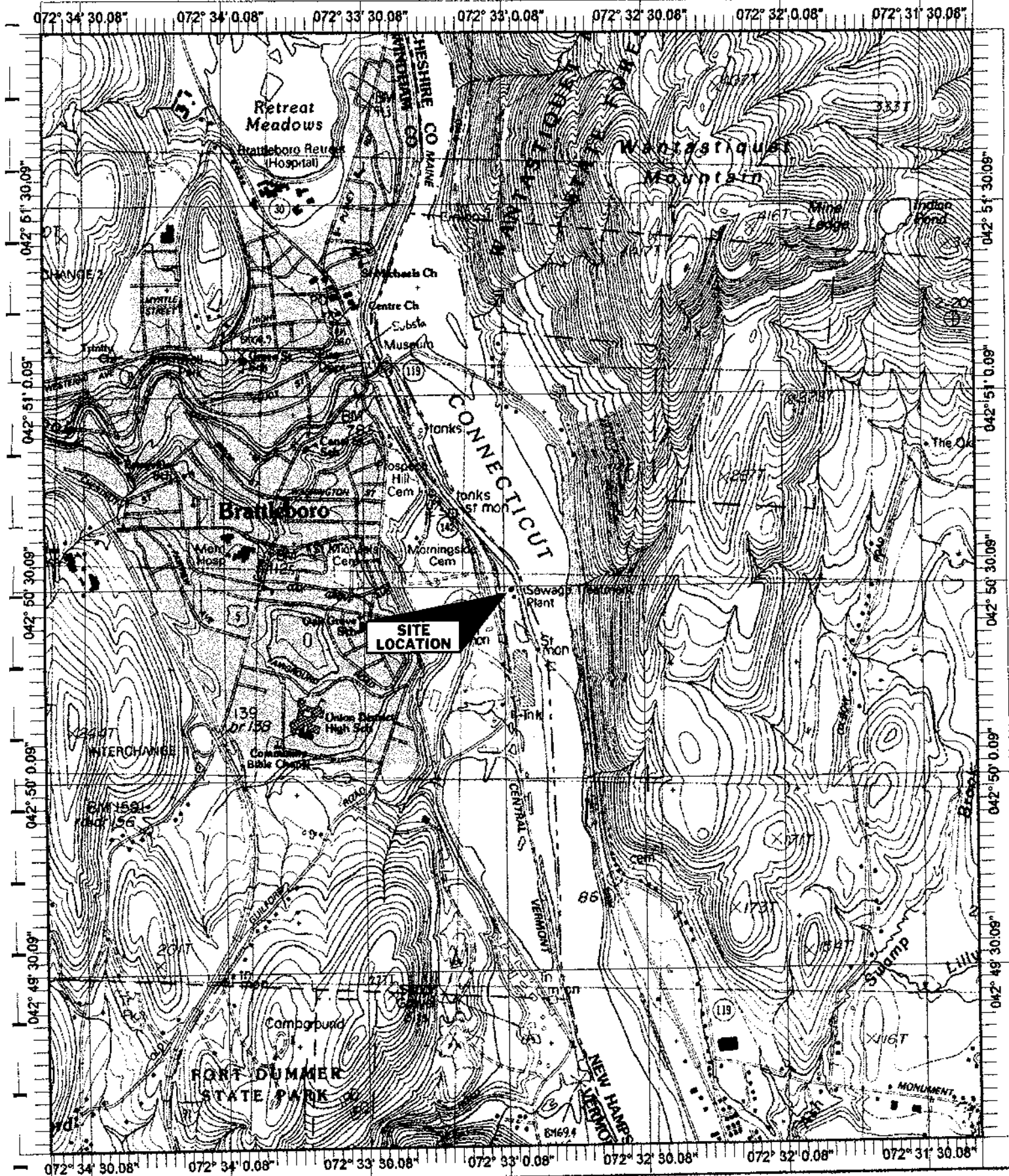
ECS recommends that the monitoring wells at this site be sampled again in the spring time, when groundwater elevations are highest.

In addition, ECS recommends that samples from the polyencapsulated soil stockpile be screened for VOCs with a PID, to assess contaminant levels in the pile and determine whether they may be thin spread on site.

Pending DEC approval of these recommendations, ECS will schedule a sampling event for April, 1999.

\\40099.10\Summary.rpt.wpd

Appendix A
Site Locus Map



Name: BRATTLEBORO
Date: 1/4/99
Scale: 1 inch equals 2000 feet

Location: 042° 50' 29.6" N 072° 32' 58.6" W
Caption: Brattleboro Sewerage Treatment
626 Vernon Road
Brattleboro, VT

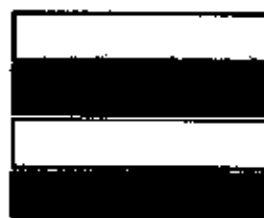
Appendix B

Site Plan

North



Soil Stockpile
Approx. 27 cubic yards



Drying Beds
(not to scale)

Driveway

Building

Sidewalk

Building

Connecticut River
Approx. 200 feet



Legend

- ◆ Monitoring Well
- ECS-2 Monitoring Well Identification
- | |
|-------|
| 93.71 |
| 93.57 |
| 93.55 |

 Rim Elevation
PVC Elevation
Groundwater Elevation
- | |
|--|
| |
|--|

 Former 1,500 Gal.
#2 Fuel Oil UST
- Area of Excavation
- Groundwater contour

General Notes

Site Plan prepared from information obtained from the Town of Brattleboro Assessor's Office and a site visit by representatives of ECS, Inc.

All locations, dimensions of the site features, and property lines are approximate. This plan should not be used for construction or land conveyance purposes.

Vertical and horizontal location of monitoring wells and selected site features determined by a site survey conducted by representatives of ECS, Inc.

Groundwater contours are based on measurements made on 10/28/98. Fluctuations in the level of groundwater may occur due to factors not accounted for at the time the measurements were made.

Monitoring well ECS-4 data was not used in generating groundwater contours due to location in backfill material.

Groundwater contours and flow directions assumed homogeneous, isotropic aquifer conditions, and horizontal flow.

Groundwater contours are interpolated between data points and inferred in other areas.



ENVIRONMENTAL COMPLIANCE SERVICES, INC.
507 Old Colford Road, P.O. Brattleboro, VT 05301

Brattleboro Waste Water Treatment Plant
505 Vernon Road
Brattleboro, VT

Site Plan

Town of Brattleboro, Dept. of Public Works

DATE	BY	CHECKED BY	APPROVED BY
CS	CS	DCB	DCB
DATE	DATE	JOB NO.	FIGURE NO.
1" = 50'	Jan. 1999	40088.10	2

Appendix C

Soil Boring/Monitoring Well Construction Logs

ENVIRONMENTAL COMPLIANCE SERVICES, INC.
SOIL BORING/MONITORING WELL LOG

Project #: <u>40099</u> Date: <u>10/16/98</u> Project Name: <u>Brattleboro Wastewater</u> Treatment Plant _____ Location: <u>Brattleboro, VT</u> Driller: <u>ECS</u> ECS Personnel: <u>JCP</u> Boring/Well #: <u>ECS-1</u> Sheet <u>1</u> of <u>1</u>						<u>SITE LOCUS</u>		
Depth	Blow Counts				Rec. (in.)	OVM (ppm)	Soil Characterization	As Built Diagram
	0-6	6-12	12-18	18-24				
0-2						0.0	Medium sand sark brown no odors dry	
5-7	3	3	4	5	12"	0.0	Moist - medium sand dark brown no odors	
10-12	1	1	1	1	10"	0.0	groundwater encountered medium sand dark brown no odors	
15-17	1	1	1	1	10"	1.3	GW medium sand dark brown no odors	

Drilling Method: HSA
 Total Well Depth: 15'
 Groundwater Depth: 10'
 PVC Elevation: _____

Screen Diameter: 2" Length: 10'
 Riser Diameter: 2" Length: 5'
 Slot Size: 0.010
 Ground Elevation: _____

Notes:

1. Split spoon soil samples are screened for organic vapors via headspace method using a Photovac 2020 Photoionization detector calibrated to 100 ppm isobutylene and referenced to benzene.
2. ND indicates nondetectable contaminant concentrations as read by the OVM.
3. Samples are collected using a Split Spoon Sampler unless otherwise indicated.
4. Split Spoon Sampler has a 2" diameter and is driven using a 140 lb. hammer falling 30 inches.
5. HSA = Hollow Stem Auger, AR = Air Rotary

ENVIRONMENTAL COMPLIANCE SERVICES, INC.
SOIL BORING/MONITORING WELL LOG

Project #: <u>40099</u> Date: <u>10/16/98</u> Project Name: <u>Brattleboro Wastewater Treatment Plant</u> Location: <u>Brattleboro, VT</u> Driller: <u>ECS</u> ECS Personnel: <u>JCP</u> Boring/Well #: <u>ECS-2</u> Sheet <u>1</u> of <u>1</u>							SITE LOCUS	
Depth	Blow Counts				Rec. (in.)	OVM (ppm)	Soil Characterization	As Built Diagram
	0-6	6-12	12-18	18-24				
0-2						0.0	Medium brown sand no odors dry	
5-7	3	2	2	3	8"	0.0	Medium to coarse reddish brown sand no odors moist	
10-12	1	1	2	2	10"	2.0	groundwater encountered medium reddish brown sand no odors wet	
15-17	1	1	1	1	12"	1.2	Medium brown sand no odors wet	

Drilling Method: <u>HSA</u> Total Well Depth: <u>15'</u> Groundwater Depth: <u>10'</u> PVC Elevation: _____	Screen Diameter: <u>2"</u> Length: <u>10'</u> Riser Diameter: <u>2"</u> Length: <u>5'</u> Slot Size: <u>0.010</u> Ground Elevation: _____
--	--

Notes:

1. Split spoon soil samples are screened for organic vapors via headspace method using a Photovac 2020 Photoionization detector calibrated to 100 ppm isobutylene and referenced to benzene.
2. ND indicates nondetectable contaminant concentrations as read by the OVM.
3. Samples are collected using a Split Spoon Sampler unless otherwise indicated.
4. Split Spoon Sampler has a 2" diameter and is driven using a 140 lb. hammer falling 30 inches.
5. HSA = Hollow Stem Auger, AR = Air Rotary

SOIL BORING/MONITORING WELL LOG

Project #: 40099 Date: 10/16/98 Project Name: Brattleboro Wastewater Treatment Plant Location: Brattleboro, VT Driller: ECS ECS Personnel: JCP Boring/Well #: ECS-3 Sheet 1 of 1						SITE LOCUS		
Depth	Blow Counts				Rec. (in.)	OVM (ppm)	Soil Characterization	As Built Diagram
	0-6	6-12	12-18	18-24				
0-2						8.5	Medium sand dark brown trace cobbles dry no odors	
5-7	1	1	1	2	12"	6.0	Medium sand dark brown moist no odors	
10-12	1	2	4	3	16"	6.8	medium sand dark brown wet groundwater encountered no odors	
15-17	1	1	2	2	12"	6.0	medium to fine sand dark brown wet GW no odors	
Drilling Method: HSA Total Well Depth: 15' Groundwater Depth: 10' PVC Elevation:						Screen Diameter: 2" Length: 10' Riser Diameter: 2" Length: 5' Slot Size: 0.010 Ground Elevation:		

Notes:

- Notes:
1. Split spoon soil samples are screened for organic vapors via headspace method using a Photovac 2020 Photoionization detector calibrated to 100 ppm isobutylene and referenced to benzene.
 2. ND indicates nondetectable contaminant concentrations as read by the OVM.
 3. Samples are collected using a Split Spoon Sampler unless otherwise indicated.
 4. Split Spoon Sampler has a 2" diameter and is driven using a 140 lb. hammer falling 30 inches.
 5. HSA = Hollow Stem Auger, AR = Air Rotary

ENVIRONMENTAL COMPLIANCE SERVICES, INC.
SOIL BORING/MONITORING WELL LOG

Project #: <u>40099</u> Date: <u>10/16/98</u> Project Name: <u>Brattleboro Wastewater</u> Treatment Plant _____ Location: <u>Brattleboro, VT</u> Driller: <u>ECS</u> ECS Personnel: <u>JCP</u> Boring/Well #: <u>ECS-4</u> Sheet <u>1</u> of <u>1</u>							<u>SITE LOCUS</u>	
Depth	Blow Counts				Rec. (in.)	OVM (ppm)	Soil Characterization	As Built Diagram
	0-6	6-12	12-18	18-24				
0-2						0.0	fill material fill material dark medium grain sand trace small cobbles moist no odor medium sand dark brown groundwater wet no odors fine to medium dark brown sand wet no odors	
5-7	1	2	3	4	6"	0.0		
10-12	1	3	2	1	12"	2.7		
15-17	1	1	1	1	24"	4.5		

Drilling Method: <u>HSA</u> Total Well Depth: <u>15'</u> Groundwater Depth: <u>10'</u> PVC Elevation: _____	Screen Diameter: <u>2"</u> Length: <u>10'</u> Riser Diameter: <u>2"</u> Length: <u>5'</u> Slot Size: <u>0.010</u> Ground Elevation: _____
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Notes:

1. Split spoon: soil samples are screened for organic vapors via headspace method using a Photovac 2020 Photoionization detector calibrated to 100 ppm isobutylene and referenced to benzene.
2. ND indicates nondetectable contaminant concentrations as read by the OVM.
3. Samples are collected using a Split Spoon Sampler unless otherwise indicated.
4. Split Spoon Sampler has a 2" diameter and is driven using a 140 lb. hammer falling 30 inches.
5. HSA = Hollow Stem Auger, AR = Air Rotary

Appendix D

Laboratory Data Sheets and Chain of Custody Record



SPECTRUM ANALYTICAL, INC.

Massachusetts Certification M-MA 138
Connecticut Approval # PH 0777
Rhode Island # 98 & Maine # n/a
New Hampshire ID # 2538
New York ID #11393
Florida HRS87448

*ECS, Inc.
157 Old Guilford Road, #6
Brattleboro, VT 05301*

November 16, 1998

Attn: David Balk

Client Project No.: 40099.10 Location: Brattleboro Waste Water Plant

<u>Lab ID No.</u>	<u>Client ID</u>	<u>Analysis Requested</u>
AB23361	ECS-1	TPH by GC EPA Method 8021B
AB23362	ECS-2	TPH by GC EPA Method 8021B
AB23363	ECS-3	TPH by GC EPA Method 8021B
AB23364	ECS-4	TPH by GC EPA Method 8021B
AB23365	DUP	EPA Method 8021B
AB23366	TRIP	EPA Method 8021B

Authorized by

Hanibal Tayeh
President/Laboratory Director

ENVIRONMENTAL ANALYSES

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-1
Lab ID No: AB23361

Location: Brattleboro Waste Water Plant
Client Job No: 40099.10

Matrix: Ground Water
Sampled on 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration, HCl
Container: 2 VOA Vials
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Volatile Organics

EPA Method 8021B

Parameter for AB23361	Result (in ug/L)	MDL	Analyzed	Analyst
Benzene	Not detected	1.0	11/09/98	DG
Toluene	Not detected	1.0	11/09/98	DG
Ethylbenzene	Not detected	1.0	11/09/98	DG
m-p-Xylenes	Not detected	2.0	11/09/98	DG
o-Xylene	Not detected	1.0	11/09/98	DG
Napthalene	Not detected	1.0	11/09/98	DG
1,2,4-Trimethylbenzene	Not detected	2.0	11/09/98	DG
1,3,5-Trimethylbenzene	Not detected	1.0	11/09/98	DG
Methyl-tert-butyl-ether	Not detected	2.0	11/09/98	DG
Bromofluorobenzene (%SR)	92		11/09/98	DG

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-1
Lab ID No.: AB23361

Location: Brattleboro Waste Water Plant
Client Job No.: 40099.10

Matrix: Ground Water
Collected: 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration
Container: 1 Amber Glass
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Total Hydrocarbons by GC

Modified EPA Method 8100

Parameter	Result (mg/L)	MDL	Extracted	Analyzed	Analyst
Total Hydrocarbons (GC)	1.1		11/02/98	11/06/98	ATP

Fingerprint based quantification:

Gasoline	Not detected	0.2	11/02/98	11/06/98	ATP
Fuel Oil #2	*	0.4	11/02/98	11/06/98	ATP
Fuel Oil #4	Not detected	0.7	11/02/98	11/06/98	ATP
Fuel Oil #6	Not detected	0.7	11/02/98	11/06/98	ATP
Motor Oil	Not detected	0.7	11/02/98	11/06/98	ATP
Ligroin	Not detected	0.4	11/02/98	11/06/98	ATP
Aviation Fuel	Not detected	0.4	11/02/98	11/06/98	ATP
Other Oil	Not detected	0.7	11/02/98	11/06/98	ATP
Unidentified	1.1		11/02/98	11/06/98	ATP

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from petroleum products. Possible match categories are as follows;

- Gasoline - includes regular, unleaded, premium, etc.
- Fuel Oil #2 - includes home heating oil, #2 fuel oil and diesel.
- Fuel Oil #4 - Includes #4 Fuel Oil.
- Fuel Oil #6 - includes #6 oil and bunker "C" oil.
- Motor Oil - includes virgin and waste automobile.
- Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha.
- Aviation Fuels - includes Kerosene, Jet A and JP-4.
- Other Oil - includes lubricating and cutting oil and silicon oil.

Factors such as microbial degradation, weathering and solubility generally prevent specific identification within a petroleum category. A finding of "unidentified" means that the sample fingerprint was characteristic of a petroleum product, but could not be matched to a fingerprint in the library.

After fingerprint identification, the amount present in the sample is quantified using a calibration curve prepared from a petroleum product of the same category as the identified petroleum. Unidentified petroleum is quantified using a petroleum calibration that approximates the distribution of compounds in the sample.

A * in the results column indicates the petroleum calibration used to quantify unidentified samples.

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: **ECS-2**
Lab ID No: **AB23362**

Location: **Brattleboro Waste Water Plant**
Client Job No: **40099.10**

Matrix: **Ground Water**
Sampled on 10/26/98 by **ECS**
Received on 10/27/98 by **DDR**
QC and Data Review by **AM**

Preservative: **Refrigeration, HCl**
Container: **2 VOA Vials**
Condition of Sample as Received: **Satisfactory**
Delivered by: **Courier**

Volatile Organics

EPA Method 8021B

Parameter for AB23362	Result (in ug/L)	MDL	Analyzed	Analyst
Benzene	Not detected	1.0	11/09/98	DG
Toluene	Not detected	1.0	11/09/98	DG
Ethylbenzene	Not detected	1.0	11/09/98	DG
m-p-Xylenes	Not detected	2.0	11/09/98	DG
o-Xylene	Not detected	1.0	11/09/98	DG
Napthalene	Not detected	1.0	11/09/98	DG
1,2,4-Trimethylbenzene	Not detected	1.0	11/09/98	DG
1,3,5-Trimethylbenzene	Not detected	1.0	11/09/98	DG
Methyl-tert-butyl-ether	Not detected	1.0	11/09/98	DG
Bromofluorobenzene (%SR)	92		11/09/98	DG

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-2
Lab ID No.: AB23362

Location: Brattleboro Waste Water Plant
Client Job No.: 40099.10

Matrix: Ground Water
Collected: 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration
Container: 1 Amber Glass
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Total Hydrocarbons by GC

Modified EPA Method 8100

Parameter	Result (mg/L)	MDL	Extracted	Analyzed	Analyst
Total Hydrocarbons (GC)	0.8		11/02/98	11/06/98	ATP

Fingerprint based quantification:

Gasoline	Not detected	0.2	11/02/98	11/06/98	ATP
Fuel Oil #2	*	0.4	11/02/98	11/06/98	ATP
Fuel Oil #4	Not detected	0.7	11/02/98	11/06/98	ATP
Fuel Oil #6	Not detected	0.7	11/02/98	11/06/98	ATP
Motor Oil	Not detected	0.7	11/02/98	11/06/98	ATP
Ligroin	Not detected	0.4	11/02/98	11/06/98	ATP
Aviation Fuel	Not detected	0.4	11/02/98	11/06/98	ATP
Other Oil	Not detected	0.7	11/02/98	11/06/98	ATP
Unidentified	0.8		11/02/98	11/06/98	ATP

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from petroleum products. Possible match categories are as follows;

- Gasoline - includes regular, unleaded, premium, etc.
- Fuel Oil #2 - includes home heating oil, #2 fuel oil and diesel.
- Fuel Oil #4 - Includes #4 Fuel Oil.
- Fuel Oil #6 - includes #6 oil and bunker "C" oil.
- Motor Oil - includes virgin and waste automobile.
- Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha.
- Aviation Fuels - includes Kerosene, Jet A and JP-4.
- Other Oil - includes lubricating and cutting oil and silicon oil.

Factors such as microbial degradation, weathering and solubility generally prevent specific identification within a petroleum category. A finding of "unidentified" means that the sample fingerprint was characteristic of a petroleum product, but could not be matched to a fingerprint in the library.

After fingerprint identification, the amount present in the sample is quantified using a calibration curve prepared from a petroleum product of the same category as the identified petroleum. Unidentified petroleum is quantified using a petroleum calibration that approximates the distribution of compounds in the sample.

A * in the results column indicates the petroleum calibration used to quantify unidentified samples.

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-3
Lab ID No: AB23363

Location: Brattleboro Waste Water Plant
Client Job No: 40099.10

Matrix: Ground Water
Sampled on 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration, HCl
Container: 2 VOA Vials
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Volatile Organics

EPA Method 8021B

Parameter for AB23363	Result (in ug/L)	MDL	Analyzed	Analyst
Benzene	Not detected	1.0	11/09/98	DG
Toluene	Not detected	1.0	11/09/98	DG
Ethylbenzene	Not detected	1.0	11/09/98	DG
m-p-Xylenes	Not detected	2.0	11/09/98	DG
o-Xylene	Not detected	1.0	11/09/98	DG
Napthalene	Not detected	1.0	11/09/98	DG
1,2,4-Trimethylbenzene	Not detected	1.0	11/09/98	DG
1,3,5-Trimethylbenzene	Not detected	1.0	11/09/98	DG
Methyl-tert-butyl-ether	3.9	1.0	11/09/98	DG
Bromofluorobenzene (%SR)	98		11/09/98	DG

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-3
Lab ID No.: AB23363

Location: Brattleboro Waste Water Plant
Client Job No.: 40099.10

Matrix: Ground Water
Collected: 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration
Container: 1 Amber Glass
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Total Hydrocarbons by GC

Modified EPA Method 8100

Parameter	Result (mg/L)	MDL	Extracted	Analyzed	Analyst
Total Hydrocarbons (GC)	0.9		11/02/98	11/06/98	ATP

Fingerprint based quantification:

Gasoline	Not detected	0.2	11/02/98	11/06/98	ATP
Fuel Oil #2	*	0.4	11/02/98	11/06/98	ATP
Fuel Oil #4	Not detected	0.7	11/02/98	11/06/98	ATP
Fuel Oil #6	Not detected	0.7	11/02/98	11/06/98	ATP
Motor Oil	Not detected	0.7	11/02/98	11/06/98	ATP
Ligroin	Not detected	0.4	11/02/98	11/06/98	ATP
Aviation Fuel	Not detected	0.4	11/02/98	11/06/98	ATP
Other Oil	Not detected	0.7	11/02/98	11/06/98	ATP
Unidentified	0.9		11/02/98	11/06/98	ATP

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from petroleum products. Possible match categories are as follows;

- Gasoline - includes regular, unleaded, premium, etc.
- Fuel Oil #2 - includes home heating oil, #2 fuel oil and diesel.
- Fuel Oil #4 - Includes #4 Fuel Oil.
- Fuel Oil #6 - includes #6 oil and bunker "C" oil.
- Motor Oil - includes virgin and waste automobile.
- Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha.
- Aviation Fuels - includes Kerosene, Jet A and JP-4.
- Other Oil - includes lubricating and cutting oil and silicon oil.

Factors such as microbial degradation, weathering and solubility generally prevent specific identification within a petroleum category. A finding of "unidentified" means that the sample fingerprint was characteristic of a petroleum product, but could not be matched to a fingerprint in the library.

After fingerprint identification, the amount present in the sample is quantified using a calibration curve prepared from a petroleum product of the same category as the identified petroleum. Unidentified petroleum is quantified using a petroleum calibration that approximates the distribution of compounds in the sample.

A * in the results column indicates the petroleum calibration used to quantify unidentified samples.

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-4
Lab ID No: AB23364

Location: Brattleboro Waste Water Plant
Client Job No: 40099.10

Matrix: Ground Water
Sampled on 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration, HCl
Container: 2 VOA Vials
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Volatile Organics

EPA Method 8021B

Parameter for AB23364	Result (in ug/L)	MDL	Analyzed	Analyst
Benzene	1.1	0.5	11/09/98	CH
Toluene	0.74	0.5	11/09/98	CH
Ethylbenzene	1.7	0.5	11/09/98	CH
m-p-Xylenes	4.7	1.0	11/09/98	CH
o-Xylene	13	0.5	11/09/98	CH
Napthalene	11	0.5	11/09/98	CH
1,2,4-Trimethylbenzene	21	0.5	11/09/98	CH
1,3,5-Trimethylbenzene	13	0.5	11/09/98	CH
Methyl-tert-butyl-ether	18	0.5	11/09/98	CH
Bromofluorobenzene (%SR)	105		11/09/98	CH

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: ECS-4
Lab ID No.: AB23364

Location: Brattleboro Waste Water Plant
Client Job No.: 40099.10

Matrix: Ground Water
Collected: 10/26/98 by ECS
Received on 10/27/98 by DDR
QC and Data Review by AM

Preservative: Refrigeration
Container: 1 Amber Glass
Condition of Sample as Received: Satisfactory
Delivered by: Courier

Total Hydrocarbons by GC

Modified EPA Method 8100

Parameter	Result (mg/L)	MDL	Extracted	Analyzed	Analyst
Total Hydrocarbons (GC)	4.8		11/02/98	11/07/98	ATP

Fingerprint based quantification:

Gasoline	Not detected	0.2	11/02/98	11/07/98	ATP
Fuel Oil #2	*	0.4	11/02/98	11/07/98	ATP
Fuel Oil #4	Not detected	0.7	11/02/98	11/07/98	ATP
Fuel Oil #6	Not detected	0.7	11/02/98	11/07/98	ATP
Motor Oil	Not detected	0.7	11/02/98	11/07/98	ATP
Ligroin	Not detected	0.4	11/02/98	11/07/98	ATP
Aviation Fuel	Not detected	0.4	11/02/98	11/07/98	ATP
Other Oil	**	0.7	11/02/98	11/07/98	ATP
Unidentified	4.8		11/02/98	11/07/98	ATP

Petroleum identification is determined by comparing the GC fingerprint obtained from the sample with a library of GC fingerprints obtained from petroleum products. Possible match categories are as follows;

Gasoline - includes regular, unleaded, premium, etc.

Fuel Oil #2 - includes home heating oil, #2 fuel oil and diesel.

Fuel Oil #4 - Includes #4 Fuel Oil.

Fuel Oil #6 - includes #6 oil and bunker "C" oil.

Motor Oil - includes virgin and waste automobile.

Ligroin - includes mineral spirits, petroleum naphtha, vm&p naphtha.

Aviation Fuels - includes Kerosene, Jet A and JP-4.

Other Oil - includes lubricating and cutting oil and silicon oil.

Factors such as microbial degradation, weathering and solubility generally prevent specific identification within a petroleum category. A finding of "unidentified" means that the sample fingerprint was characteristic of a petroleum product, but could not be matched to a fingerprint in the library.

After fingerprint identification, the amount present in the sample is quantified using a calibration curve prepared from a petroleum product of the same category as the identified petroleum. Unidentified petroleum is quantified using a petroleum calibration that approximates the distribution of compounds in the sample.

A * in the results column indicates the petroleum calibration used to quantify unidentified samples.

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: **DUP**
Lab ID No: **AB23365**

Location: **Brattleboro Waste Water Plant**
Client Job No: **40099.10**

Matrix: **Ground Water**
Sampled on 10/26/98 by **ECS**
Received on 10/27/98 by **DDR**
QC and Data Review by **AM**

Preservative: **Refrigeration, HCl**
Container: **2 VOA Vials**
Condition of Sample as Received: **Satisfactory**
Delivered by: **Courier**

Volatile Organics

EPA Method 8021B

Parameter for AB23365	Result (in ug/L)	MDL	Analyzed	Analyst
Benzene	1.1	0.50	11/09/98	CH
Toluene	0.78	0.50	11/09/98	CH
Ethylbenzene	1.5	0.50	11/09/98	CH
m-p-Xylenes	4.1	1.00	11/09/98	CH
o-Xylene	12	0.50	11/09/98	CH
Napthalene	9.9	0.50	11/09/98	CH
1,2,4-Trimethylbenzene	17	0.50	11/09/98	CH
1,3,5-Trimethylbenzene	10	0.50	11/09/98	CH
Methyl-tert-butyl-ether	20	0.50	11/09/98	CH
Bromofluorobenzene (%SR)	95		11/09/98	CH

SPECTRUM ANALYTICAL, INC.

Laboratory Report

Client ID: **TRIP**
Lab ID No: **AB23366**

Location: **Brattleboro Waste Water Plant**
Client Job No: **40099.10**

Matrix: **Deionized Water**
Sampled on 10/26/98 by **ECS**
Received on 10/27/98 by **DDR**
QC and Data Review by **AM**

Preservative: **Refrigeration, HCl**
Container: **1 VOA Vial**
Condition of Sample as Received: **Satisfactory**
Delivered by: **Courier**

Volatile Organics

EPA Method 8021B

Parameter for AB23366	Result (in ug/L)	MDL	Analyzed	Analyst
Benzene	Not detected	1.0	11/09/98	DG
Toluene	Not detected	1.0	11/09/98	DG
Ethylbenzene	Not detected	1.0	11/09/98	DG
m-p-Xylenes	Not detected	2.0	11/09/98	DG
o-Xylene	Not detected	1.0	11/09/98	DG
Napthalene	Not detected	1.0	11/09/98	DG
1,2,4-Trimethylbenzene	Not detected	1.0	11/09/98	DG
1,3,5-Trimethylbenzene	Not detected	1.0	11/09/98	DG
Methyl-tert-buty-ether	Not detected	1.0	11/09/98	DG
Bromofluorobenzene (%SR)	91		11/09/98	DG

Spectrum Analytical, Inc.

Laboratory Report Supplement

References

- Methods for the Determination of Organic Compounds in Drinking Water. EPA-600/4-88/039. EMSL 1988.
- Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020. EMSL 1983.
- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EMSL 1982.
- Test Methods for Evaluating Solid Waste. Physical/Chemical Methods. EPA SW-846. 1986.
- Standard Methods for the Examination of Water and Wastes. APHA-AWWA-WPCF. 16th Edition. 1985.
- Standard Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography. ASTM D 3328. 1982.
- Oil Spill Identification System. U.S. Coast Guard CG-D-52-77. 1977.
- Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA 600/4-79-019. EMSL 1979.
- Choosing Cost-Effective QA/QC (Quality Assurance/Quality Control) Programs for Chemical Analyses. EPA 600/4-85/056. EMSL 1985.

Report Notations

Not Detected,	=	<i>The compound was not detected at a concentration equal to or above</i>	
Not Det, ND or nd		<i>the established method detection limit.</i>	
NC	=	<i>Not Calculated</i>	
MCL	=	<i>EPA Maximum Contamination Level</i>	
VOA	=	<i>Volatile Organic Analysis</i>	
BFB	=	<i>4-Bromofluorobenzene</i>	<i>(An EPA 624 Surrogate)</i>
p-DFB	=	<i>1,4-Difluorobenzene</i>	<i>(An EPA 624 Surrogate)</i>
CLB-d5	=	<i>Chlorobenzene-d5</i>	<i>(An EPA 624 Surrogate)</i>
BCP	=	<i>2-Bromo-1-chloropropane</i>	<i>(An EPA 601 Surrogate)</i>
TFT	=	<i>a,a,a-Trifluorotoluene</i>	<i>(An EPA 602 Surrogate)</i>
Decachlorobiphenyl	=	<i>(an EPA 608/8080 Surrogate)</i>	

Definitions

Surrogate Recovery = The recovery (expressed as a percent) of a non-method analyte (see surrogates listed above) added to the sample for the purpose of monitoring system performance.

Matrix Spike Recovery = The recovery (expressed as a percent) of method analytes added to the sample for the purpose of determining any effect of sample composition on analyte recovery.

Laboratory Replicate = Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of laboratory duplicates give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

Field Duplicate = Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analysis of Field duplicates give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.

Relative Percent Difference (% RPD) = The precision measurement obtained on duplicate/replicate analyses. %RPD is calculated as:

$$\%RPD = \frac{(\text{value1} - \text{value2})}{\text{ave. value}} * 100\%$$



SPECTRUM ANALYTICAL

CHAIN OF CUSTODY RECORD

Special Handling:

☒ Standard TAT - 7 to 10 business days☐ Rush TAT - Date Needed: _____

• All TATs subject to laboratory approval; min. 24 hour notification needed for rushes.

• Samples disposed of after 60 days unless otherwise instructed.

Page 1 of 1Report To: ECS-VTInvoice To: ECS-MAProject No.: 40099.10Site Name: Brattleboro Waste Water PlantLocation: Brattleboro State: VTProject Mgr.: D. Baile

P.O. No.: _____ RQN: _____

Sampler(s): JCP1=4°C 2=HCl 3=H₂SO₄ 4=HNO₃ 5=NaOH 6=MeOH 7=_____

Containers:

Analyses:

Notes:

DW=Drinking Water GW=Ground Water WW=Waste Water
SO=Soil SL=Sludge O=Oil X1= Dilution X2=_____

G=Grab C=Composite

Lab Id:	Sample Id:	Date:	Time:	Type	Matrix	Preservative	pH	# Of VOA Vials	# Of Amber Glass	# Of Clear Glass	# Of Plastic						
AB 233601	ECS-1	10/26/98	12:30	G	GW	12		2	1				1	1			
AB 233602	ECS-2		12:33	G	GW	12		2	1				1	1			
AB 233603	ECS-3		12:35	G	GW	12		2	1				1	1			
AB 233604	ECS-4		12:40	G	GW	12		2	1				1	1			
AB 233605	DUP			G	GW	12		2					1	1			
AB 233606	TFip			G	XI	12		1					1				
AB																	
AB																	
AB																	
AB																	

Additional Instructions: _____

Relinquished By: _____

Received By: _____

Date: _____

Time: _____

VT VOC SCAN

Juan H. Fittens
C. Hennings

C. Hennings
W. Hennings

10/27/98 14:30
10/27/98 16:10

Culd.